



TOPIC: Rainwater Harvesting – OPSC/6/#2

**CODE: Oregon Plumbing Specialty Code- 2014 Edition
Oregon Residential Specialty Code- 2014 Edition**

REVISED: September 1, 2015 [Paul L. Scarlett], Director

**REFERENCE: Section 301.2 & Section 601.1 – Oregon Plumbing
Specialty Code (OPSC)**

**SUBJECT: Rainwater Harvesting Systems for Non-potable Use
for Residential or Commercial Uses**

QUESTION: 1. What is harvested rainwater?

RESPONSE: 1. Harvested rainwater is untreated rainwater collected for limited use in specific plumbing systems. The rainwater may be collected in a variety of ways, and is then stored in a cistern for use on an as needed basis.

QUESTION: 2. What are non-potable uses?

RESPONSE: 2. Harvested rainwater is not considered potable (drinkable) water. Harvested rainwater (non-potable) may be used for irrigation/garden, hose bibbs, toilets, urinals, clothes washing, and heating, ventilation, and air conditioning make-up water supplies. Proper cross connection protection, system maintenance and system marking are critical for the prevention of contamination to household occupants and the municipal water system.

QUESTION: 3. Can harvested rainwater be used for potable uses under any circumstances?

RESPONSE: 3. Use of harvested rainwater for potable purposes requires that the water be treated and meet State and Federal safe drinking water standards. Such systems are often complicated and expensive, and require continual

maintenance, monitoring and testing. For this reason, the Bureau of Development Services (BDS) will review and consider these types of systems through the BDS administrative appeals process on a system by system basis. Rainwater used for potable purposes is not the subject of this code guide.

QUESTION: 4. Can harvested rainwater be used for irrigation only?

RESPONSE: 4. When harvested rainwater is intended for irrigation only and the system is completely separate from the municipal water system and any plumbing in the structure, the system is not regulated by this code guide. Although no plumbing permit is required, these systems still need to be approved by the Bureau of Environmental Services (BES) for stormwater management. In addition, other permits, such as an electrical permit for any pumps installed or a grading permit for underground pipe installation, may be necessary depending upon system size and complexity.

QUESTION: 5. Can harvested rainwater collected and stored on one property be conveyed, sold, diverted, or transferred to another property or to the public?

RESPONSE: 5. Harvested rainwater that is the subject of this guide may not be conveyed, sold, diverted, or transferred to another property or to the public. Instead, BDS will review and consider these types of systems through the BDS administrative appeals process on a system by system basis.

QUESTION: 6. What are the definitions, requirements, installation standards, and limitations for one or two family dwelling (home) or commercial rainwater harvesting systems for non-potable uses with the City?

RESPONSE: 6. The balance of this guide provides a basic rainwater harvesting system to provide non-potable water for use inside or outside building within the boundaries of a property. Rainwater harvesting systems that are designed using the standards outlined below do not need to be approved through the BDS administrative appeals process.

A. General. All components of the system not specifically addressed by this guide shall meet all applicable requirements of the OPSC. In addition:

1. To ensure proper system installation, the code, this guide, and any applicable manufacturer's installation instructions must be followed;

2. All materials used in installation of piping, plumbing, or rainwater harvesting systems must be approved for the specific use in the OPSC or listed by an ANSI accredited product certification program;
3. Engineered systems shall be installed per plans and specifications of the engineer of record; and
4. Rainwater shall only be harvested from roof surfaces. Harvest shall not occur from the following locations:
 - a. Any vehicular or pedestrian area;
 - b. Surface water runoff; or
 - c. Bodies of standing water.

B. Zoning Requirements. Rainwater harvesting systems must comply with applicable provisions of the Zoning Code (Title 33). Base zone development standards, plan districts, environmental overlay zones, or design overlay zones may affect or restrict cistern or sun barrier placement or design.

C. Definitions. In addition to other definitions used in the OPSC, the following definitions apply to rainwater harvesting systems:

1. **Auxiliary supply** – piping arranged and protected from contamination to provide an alternate means of filling a cistern.
2. **Catchment** – the roof surface used for the collection of rainwater.
3. **Cistern (Storage Tank)** – a reservoir for storing rainwater.
4. **Downspout**- an exterior vertical drainage pipe for conveying storm water from the roof or gutters to the cistern.
5. **Flat** – having a slope no greater than 1 in 50.
6. **Non-potable water** - rainwater harvested for the purpose of supplying water to irrigation, hose bibbs, water closets, urinals, clothes washing, and/or HVAC make-up water.
7. **Pump** – mechanical device for moving fluids (rainwater).
8. **Rainwater Harvesting System (RWS)** – cistern(s) pipe, fittings, pumps and other appurtenances required for and used to harvest and distribute rainwater.
9. **Return elbow** – a section of pipe with a 180-degree bend.
10. **Screen** – corrosion resistant wire or other approved mesh having openings in determined sizes.
11. **Sloped or sloping** – having a slope greater than 1 in 50.
12. **Sun barriers** – a structure erected specifically to shelter a cistern from the direct rays of the sun.
13. **Potable water** – water that is satisfactory for drinking, culinary, and other domestic purposes.

14. **Roof wash or roof washer** – a device or method for removal of contaminants from collection surface by diverting initial rainfall from entry into the cistern(s).

D. System Components. The following are components of a rainwater harvesting system.

1. **Roof surface.** The roof surface is the area of rainwater collection that has fallen on a building roof.
2. **Gutters and Downspouts.** Gutters and downspouts are used to convey the rainwater from the roof surface to the roof washer and the cistern.
3. **Roof Washer.** The roof washer pre-treats rainwater before it enters the cistern.
4. **Cistern.** The cistern is the reservoir that holds the collected rainwater for distribution. It is the central portion of the rainwater harvesting system. Protection and maintenance of the cistern is essential for the health of the system. It is also extremely important that the cistern be sized adequately for the size of the household and the use of the water.
5. **Pump.** A pump is often necessary to distribute the harvested rainwater from the cistern to the designated fixtures.
6. **Piping System.** The piping system conveys the harvested rainwater and distributes it to various fixtures.

E. Requirements for System Components

1. **Roof Surface.** The roof surface shall comply with the following:
 - a. The roof surface may be constructed of any material accepted by BDS;
 - b. The roof surface shall be accessible, maintained clean and free from debris; and
 - c. The catchment area shall be based upon the footprint of the roof-not the actual area of the roof surface-based on the outside dimension of the roof.
2. **Gutters and Downspouts.** Gutters and downspouts shall comply with the following:
 - a. Gutter and down spout materials are not required to meet material specifications found in the plumbing portion of the code;
 - b. Gutters shall be continuous or seamless and constructed of materials approved for their intended use;

- c. Plastic materials shall be protected from UV radiation by factory applied protective coating or painted with a compatible latex paint. Piping and solvent creams shall be approved for the intended use;
 - d. Metal materials shall be seamless aluminum, galvanized steel or other approved material.
 - e. All gutters leading to the cistern shall be fitted with leaf screens the entire length of the gutter including the downspout opening. Screen openings shall be no larger than .5 inches;
 - f. Gutters shall have a continuous grade with a minimum slope of 1/16 inch per 1 foot to the outlet leader with no sags or flat portions where water will collect or stand;
 - g. Gutter outlets may be connected indirectly to the downspout with a screened leaf-protected receptor inlet;
 - h. Downspouts shall be continuously graded from the roof to the cistern with a minimum slope of ¼ inch per 1 foot. No portion of the downspout shall be installed in a manner which will hold water;
 - i. Piping from the downspout to the cistern shall be sized according to Table 11-1 of the OPSC; and
 - j. Gutters and downspouts shall be clean and maintained on a regular basis.
3. **Roof washers.** All rainwater harvesting systems using impervious roof surfaces shall have at least one roof washer. A roof washer is not required for pervious roof surfaces such as eco-roofs. Roof washers shall comply with the following:
- a. All collected rainwater shall pass through a roof washer before the water enters the cistern(s);
 - b. If more than one cistern is used, a roof washer shall be provided for each cistern;
 - c. The following requirements apply to all roof washers:
 - (1) Roof washers shall be listed factory assemblies or constructed of approved materials on site;
 - (2) The inlet to the roof washer shall be provided with a debris screen that protects the roof washer from the intrusion of waste and vermin. The debris screen shall be corrosion resistant and shall have openings no larger than .5 inches and no smaller than .25 inches nominal;
 - (3) The roof washer shall automatically divert a minimum of the first 10 gallons from each rainfall event away from the cistern. The device shall not rely on manually operated valves or other devices to do the diversion;

- (4) The roof washer shall have minimum dimensions of 30 inches tall, and be 24 inches in diameter or 24 inches square;
- (5) The roof washer shall contain 6 inches of pea gravel. The entire surface of the gravel shall be covered with filter fabric (LINQ 125EX; LINQ TYPAR3201; TNS E040; TNS R040; AMOCO 4535 or Marafi 140NL). The filter fabric shall be topped with 18 inches of sand conforming to OAR 340-71-295 (3) (e) or silica sand meeting either NSF/ANSI 61 or AWWA B100-53, Section A 2.4;
- (6) The outlet for the initial rainfall discharge shall be located in the side of the roof washer at or near the bottom. The outlet pipe shall be .5 inches nominal, capped with a 3/16 inch drain hole and the discharge shall be directed to a BDS and BES approved location;
- (7) The outlet pipe to the cistern shall be located in the pea gravel layer of the roof washer. The pipe shall be 4 inch nominal and fitted with an approved clean-out fitting. Access to the clean-out fitting shall be provided;
- (8) The outlet pipe entering the cistern shall terminate in a return elbow a minimum of 12 inches above the cistern floor;
- (9) Roof washers shall have a cleanout fitting in the bottom of the device;
- (10) Roof washers shall have an automatic means of self-draining between rain events; and
- (11) Roof washers shall be accessible for maintenance and service.

4. **Cisterns.** Cisterns shall comply with the following:

a. **General.**

- (1) Adequate access for cleaning and maintenance purposes shall be provided;
- (2) Cisterns which have been previously used for other purposes are prohibited;
- (3) Cisterns shall be listed for use with potable water;
- (4) Cisterns shall be opaque or painted to prohibit algae growth. Polypropylene tanks shall not be painted; and
- (5) Cisterns shall be capable of being filled from both the rainwater harvesting system and the municipal water

system. The municipal system shall be protected from cross contamination by the following:

- (a) a reduced pressure backflow assembly listed on the Approved Backflow Prevention Assembly List published by the Oregon Health Division (OHD); and
- (b) an air gap properly sized and constructed per OPSC Table 6-3.

Backflow assemblies shall be maintained and tested according to requirements of the Water Bureau.

b. Size and Structure.

- (1) Any cistern, or total of cisterns used, shall have a minimum capacity of 1,500 gallons;
- (2) Cisterns shall be watertight and designed to withstand the structural loads required for their size and shape;
- (3) For above grade cisterns, the ratio of the cistern size shall not be greater than 1:1 height to width. The ratio for below grade cisterns is not limited;
- (4) Below grade cisterns made of plastic shall be reinforced and able to withstand the weight of the surrounding fill and soil and full capacity of water; and
- (5) Cisterns made of concrete must be constructed to withstand the load of water and any other applicable structural forces.

c. Location.

- (1) Cisterns may be installed either above or below grade;
- (2) Below grade cisterns shall be provided with manhole risers a minimum of 8 inches above surrounding grade;
- (3) Above grade cisterns may be located in the following places:
 - (a) basements or crawl spaces;
 - (b) garages;
 - (c) sheds; or
 - (d) under specially constructed sun barriers; and
- (4) All cisterns shall be installed in accordance with the manufacturer's installation instructions. Where the installation requires a foundation, the foundation shall be flat and shall be capable of supporting the cistern weight when the cistern is full.

d. Protection. Cisterns shall be protected from direct sunlight. Trees or other vegetation shall not constitute acceptable protection.

- e. **Inlets, outlets and openings.**
 - (1) Cisterns must be completely covered. Covers must be sturdy and be constructed in such a way that they will not allow water to collect on the surface;
 - (2) All cistern openings shall be protected from unintentional entry by humans or vermin. Manhole covers shall be secured and locked to prevent tampering;
 - (3) Where an opening is provided that could allow the entry of personnel, the opening shall be marked, "DANGER – CONFINED SPACE";
 - (4) Cistern outlets shall be located at least 12 inches above the bottom of the cistern; and
 - (5) Cisterns shall be vented when necessary. Cistern vents shall turn down and be equipped with a screen having openings of no greater than .25 inches.

- f. **Overflow.** The cistern shall be equipped with an overflow device.
 - (1) The overflow device shall consist of a pipe at least equal in size to the inlet pipe, but no less than 4 inches in diameter located within 2 inches of the top of the cistern;
 - (2) The overflow outlet shall be protected with a screen having openings no greater than .25 inches; and
 - (3) BDS and BES shall approve the discharge location of the overflow water. It shall not connect to any sanitary or combines storm/sanitary sewer.

- 5. **Pump.** Where a pump is provided in conjunction with the rainwater harvesting system the pump shall comply with the following:
 - a. The pump and all other pump components shall be listed and approved for use with potable water systems;
 - b. The pump shall be capable of delivering a minimum of 15psi residual pressure at the highest outlet served. Minimum pump pressure shall allow for friction and other pressure losses. Maximum pressure shall not exceed 80psi. Pressure tanks shall be of the expandable diaphragm type and sized based upon the peak flow capacity of the pump;
 - c. Pumps shall be a minimum of horsepower or as specified by the manufacturer. A full size check valve shall be installed between the storage tank and the pump inlet. Pump inlet piping shall be a minimum of one ¾ inch or a specified by the manufacturer.

Pressure tanks shall be sized based upon the demand required for the intended use. On-demand pump systems, which incorporate the pump, motor, controller, check valve, and pressure tank may be used;

- d. Water intake supply from cisterns to pumps shall be from a floating submerged intake pipe or equivalent; and
- e. Pumps shall be at an elevation as close to practical as the elevation of the cistern. Pumps shall be in a location which is protected from freezing, overheating or from other damage.

6. **Piping.** Piping for rainwater harvesting systems shall comply with the following:

- a. Piping for rainwater harvesting systems shall be separate from any domestic potable piping system;
- b. There shall be no direct connection of any rainwater harvesting pipe system and any domestic potable water pipe system;
- c. **Materials.**
 - (1) Pipe used to convey harvested rainwater shall be:
 - a) Purple in color and shall conform to ASTM D-2737 (PE 3408); or
 - b) Meet the requirements for potable water distribution pipe and be continuously wrapped with purple mylar tape meeting the following requirements:
 - (i) minimum nominal thickness of .0005 inches,
 - (ii) minimum width of 2 inches,
 - (iii) made of PVC with a synthetic rubber adhesive,
 - (iv) have a clear polypropylene protective coating, and include the wording, "CAUTION: RECLAIMED WATER , DO NOT DRINK" every four feet along its length, but in no case less than once per room. The lettering shall be black against a purple background, and shall comply with Table 6-1 of the OPSC;
 - (2) Fittings and other system components shall be listed for use in conjunction with specified piping; and
 - (3) Both piping and fittings shall be installed as required by applicable code and standards.
- d. Every water closet or urinal supply, hose bibb, irrigation outlet, or other fixture shall be permanently identified with an indelibly marked placard stating: "CAUTION: RECLAIMED WATER, DO NOT DRINK"; and

- e. Where rainwater harvesting pipe and potable water pipe are installed in the same trench, wall cavity or other location, the potable water pipe shall be separated by a minimum distance of twelve inches (12") above and away from the rainwater harvesting pipe.

F. Permit and Inspection Requirements. Rainwater harvesting system abandonment and potable water installations require permit(s) and inspection(s) approval(s).

1. **Permits.** The following permits are necessary for the installation of a rainwater harvesting system:
 - a. Plumbing permit for rainwater harvesting systems.
 - b. Electrical permit for the pump or other electrical controls.
 - c. Building permits for cistern footings, foundations, enclosures and roof structures.
 - d. Site Development permits may be necessary for underground tanks.
2. **Application.** The following information must be provided with the permit application for a rainwater harvesting system:
 - a. Site plan, including site elevations;
 - b. System demand;
 - c. Isometric drawing of rainwater harvesting system (including piping and section diagrams) and domestic potable water systems, including sizing and dimensions;
 - d. Specifications and manufacturer's installation instructions for:
 - (1) Cistern(s); and/or
 - (2) Pump; and
 - e. Engineering. Installation, including but not limited to the following systems, will require structural engineering:
 - (1) Cisterns that are located on top of a building structure; or
 - (2) Cisterns that are located on sloping sites.

Information in addition to that listed above may be necessary in some instances. The size and complexity of the building, site and system will determine the necessity for additional information.

3. **Inspections.** Rainwater harvesting systems shall be inspected according to the following schedule:

- a. Inspection of all elements before they are covered (rough-in inspection).
 - b. Other inspections as needed.
 - c. Final inspection including testing. In addition to other testing required by the OPSC for plumbing systems, the following also apply:
 - (1) **Cisterns.** Cisterns shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight; and
 - (2) **Piping.** A flow test shall be performed through the system to the point of reclaimed water distribution and disposal. In addition, the water distribution system shall tested and proved tight at the working pressure. Where the manufacturer permits, a 50 psi air test may substitute for the test above. All lines and components shall be watertight.
4. **Recording.** Rainwater harvesting system installations shall be recorded with the appropriate county recorder. (See attached). A copy of the recorded document shall be supplied to BDS.
5. **System Maintenance.** Rainwater harvesting systems shall be maintained in functioning order, for the life of the system. It is the property owner's responsibility to maintain the system until the system is abandoned as prescribed in this guide.
6. **System Abandonment.** If the owner of a rainwater harvesting system elects to cease use of, or fails to properly maintain such system, they shall abandon the system. To abandon the system one shall:
- a. Remove the system entirely;
 - b. Replace the rainwater harvesting pipe system with an approved potable water supply pipe system. Where an existing potable pipe system is already in place, fixtures may be re-connected to the existing system; and
 - c. Record the abandonment in the appropriate county recorder noting the deletion of the system. A copy of the recorded document shall be supplied to BDS. (See attached)

Alternatives to this code guide may be reviewed on a case-by-case basis through the BDS administrative appeals process.

OPSC/6/#2

Rainwater Harvesting Systems for Non-potable Use for Residential or Commercial

Page 12 of 15

September 1, 2015

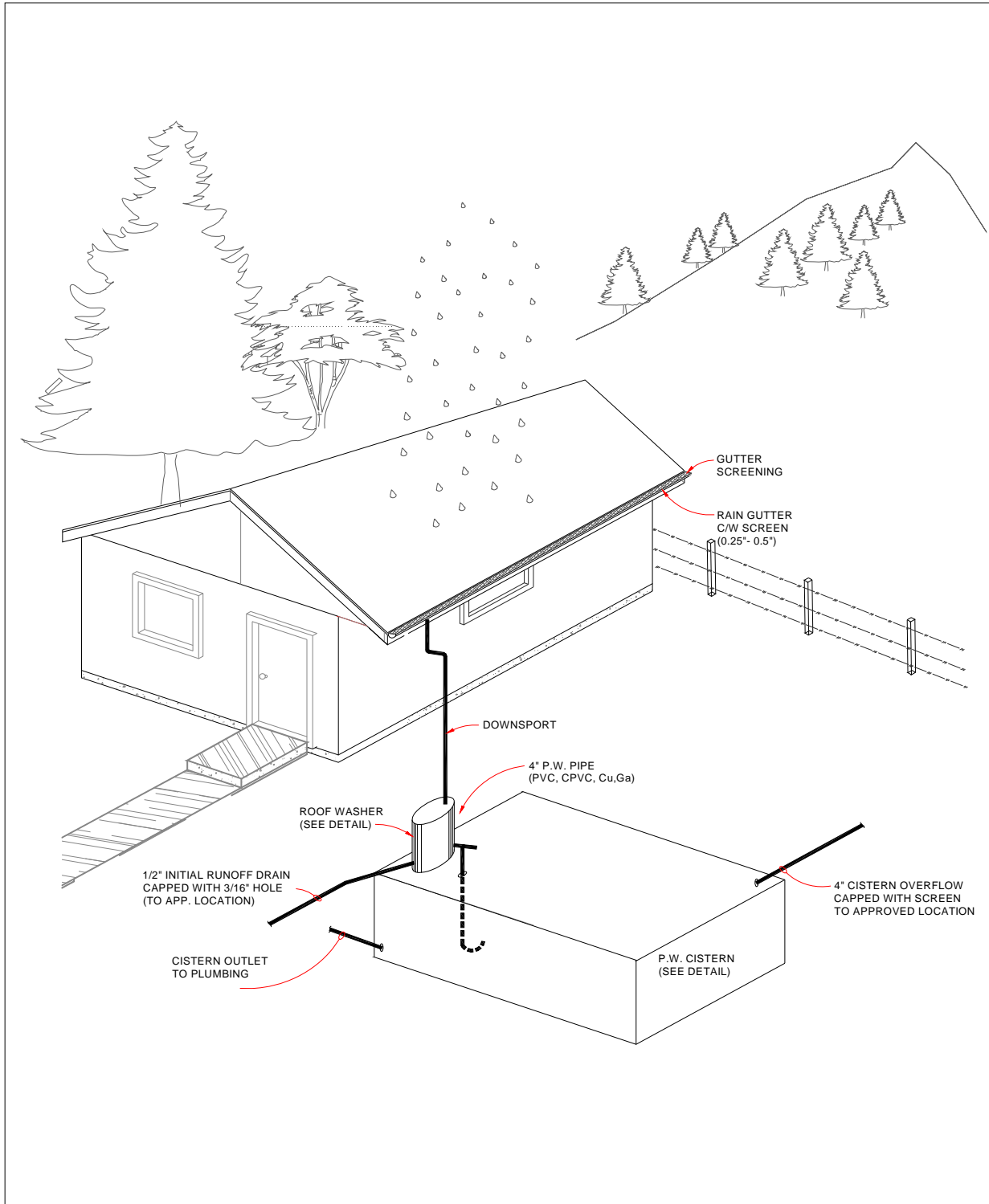
List of Attached Drawings & Examples for One or Two Family Rainwater Harvesting Systems only:

- Collection Detail
- Distribution Detail
- Cistern Detail
- Roofwasher Detail
- Notice of Rainwater Harvesting System Installation
- Notice of Rainwater Harvesting System Abandonment

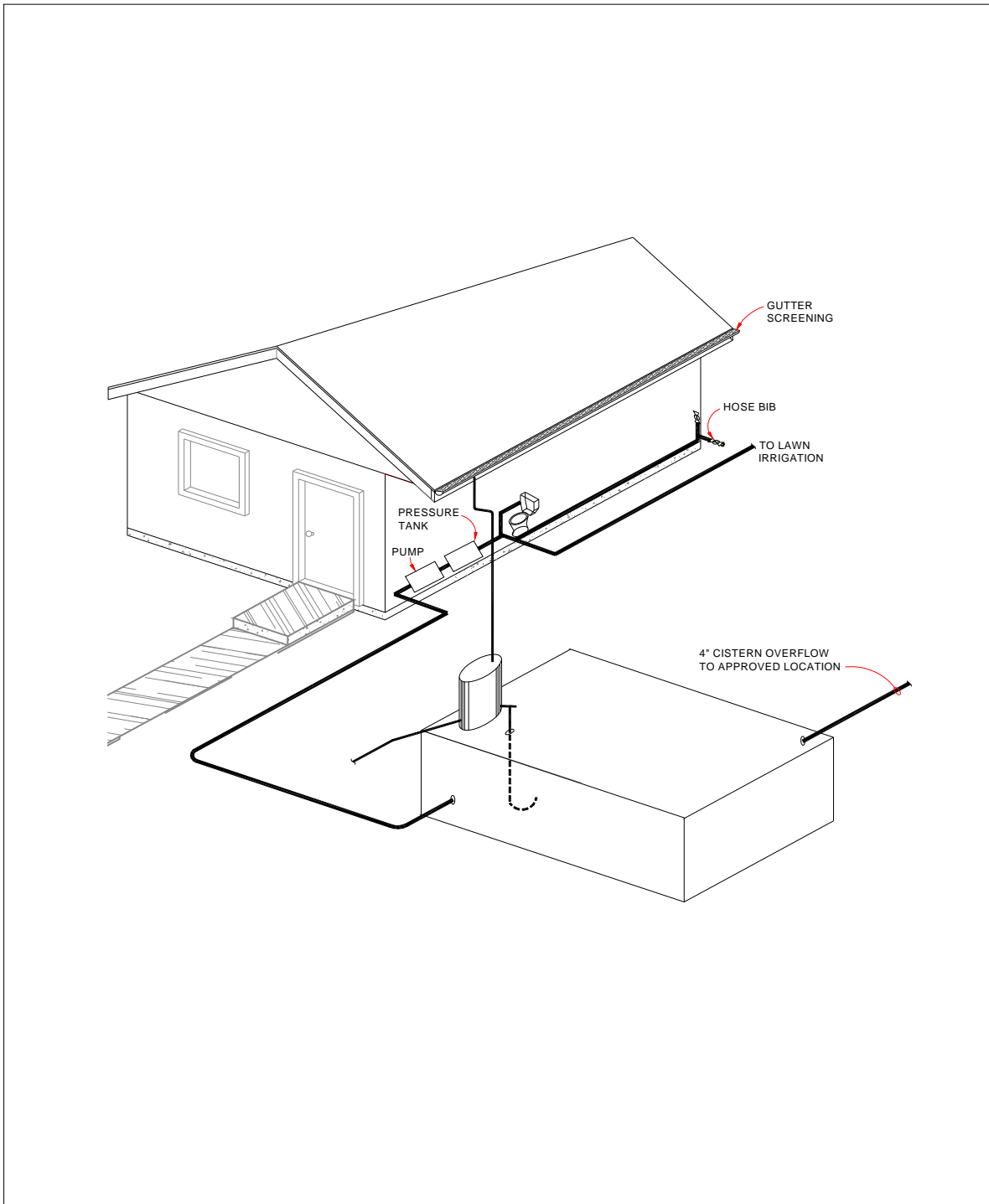
Updates March 13, 2001 edition

New March 13, 2001

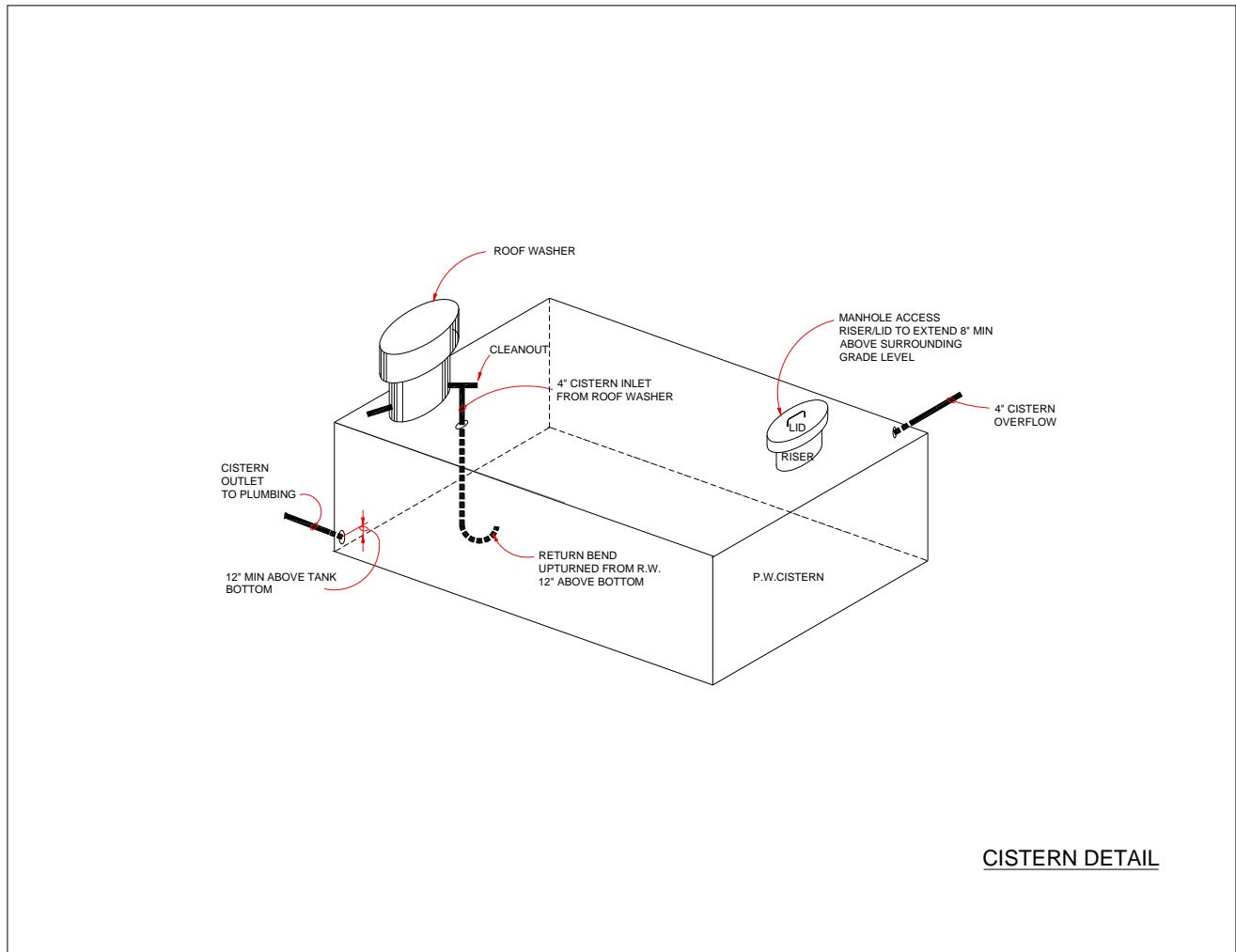
One or Two Family Rainwater System Diagram – Collection Detail



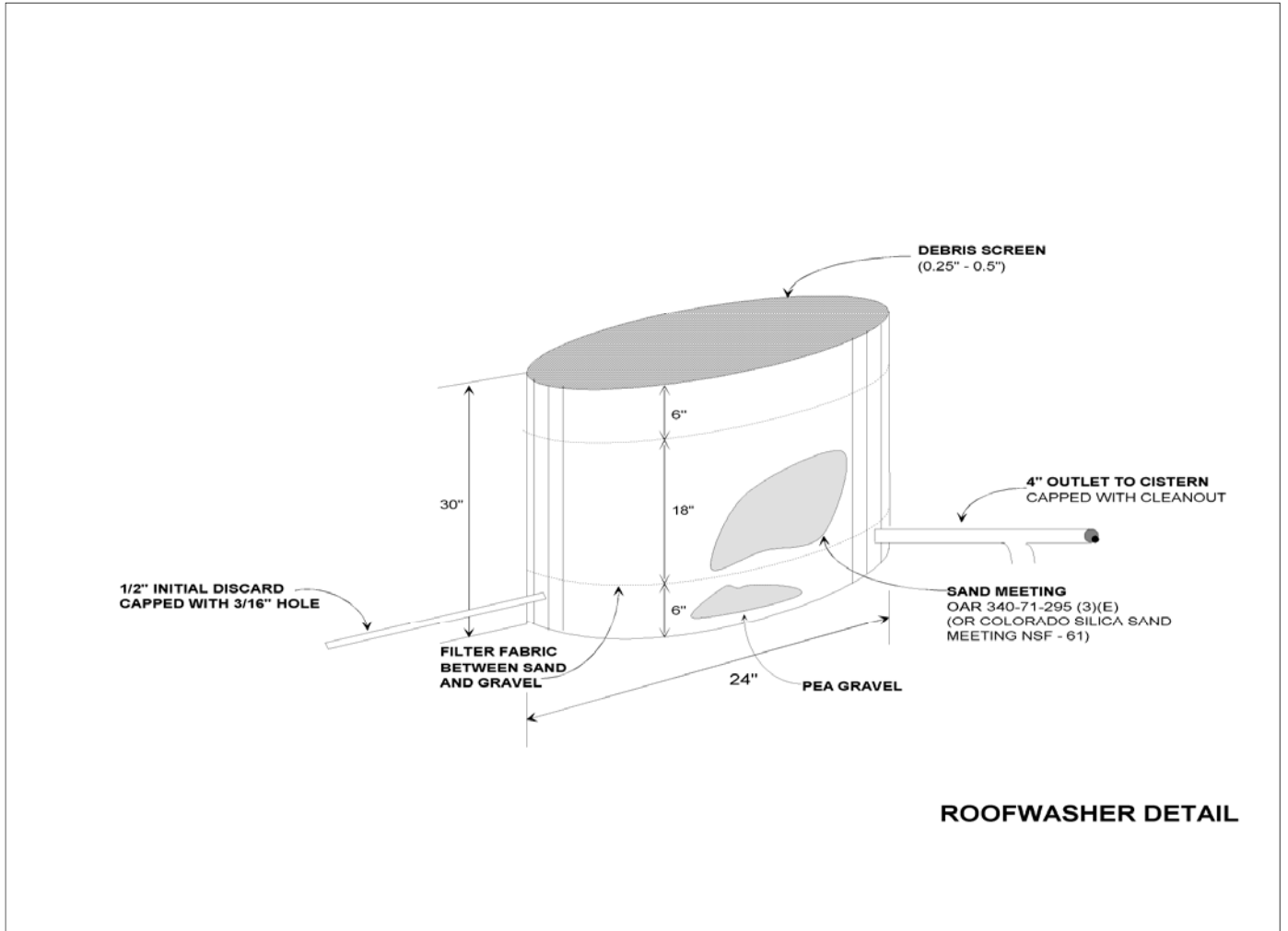
One or Two Family Rainwater System Diagram – Distribution Detail



One or Two Family Rainwater System Diagram – Cistern Detail



One or Two Family Rainwater System Diagram – Roofwasher Detail



After Recording Return to:

Bureau of Development Services
Attn: DSC Resource Records 299/5000
1900 SW 4th Avenue
Portland OR 97201

**City of Portland
Notice of Rainwater Harvesting System Installation**

This document verifies and legally records that the property located at¹:

Acquired on²: _____

Is equipped with a functioning rainwater harvesting system in addition to the municipal water system. This system serves (check all that apply):

- Water closets
- HVAC make-up
- Clothes Washing
- Hose bibbs
- Other irrigation equipment

³Done this ___ day of _____, 20___ by _____ Done this ___ day of _____, 20___ by _____

Signature: _____ Signature: _____

Print Name: _____ Print Name: _____

Owner _____ Owner _____

State of Oregon)
)
County of _____)

On this ___ day of _____, 20___, personally appeared the above named

⁴Owner(s) _____ and
acknowledged

the foregoing instrument to be a voluntary act and deed.

Before Me: _____
Notary Public for the State of Oregon

My commission expires: _____

Instructions for Filling out the Recording Document

(Do Not Record This Page. Doing so will result in additional recording fees.)

- 1.** Please provide the full legal description as shown at the appropriate county recording office. Include the addition, lot and block. If the legal description takes up more room than the space provided, it may be attached to the recording document. Indicate that the legal description has been attached in the location provided for the description itself.
- 2.** Include the month, day, and year that the property was acquired by the current owner(s).
- 3.** All current property owners must sign the recording document in front of a public notary.
- 4.** Notary will print all names of signing parties in this location.
- 5.** Note: The county recorder may charge a fee for recording.

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- 2.** Include the month, day, and year that the property was acquired by the current owner(s).
- 3.** Indicate the date that the system was abandoned.
- 4.** All current property owners must sign the recording document in front of a public notary.
- 5.** Notary will print all names of signing parties in this location.
- 6.** Note: The county recorder may charge a fee for recording.